

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
16 September 2004 (16.09.2004)

PCT

(10) International Publication Number  
**WO 2004/078652 A1**

(51) International Patent Classification<sup>7</sup>: **C01G 25/00**,  
25/02

(21) International Application Number:  
PCT/KR2003/002619

(22) International Filing Date: 1 December 2003 (01.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
10-2003-0014245 7 March 2003 (07.03.2003) KR

(71) Applicant (for all designated States except US): **KO-REAN RESEARCH INSTITUTE OF CHEMICAL TECHNOLOGY** [KR/KR]; 100 Jang-dong, Yuseong-ku, Daejeon 305-343 (KR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **KIM, Hee Young** [KR/KR]; 101-203 Hanbit Apartment, Eoeun-dong,

Yuseong-ku, Daejeon 305-755 (KR). **PARK, Yong Ki** [KR/KR]; 119-302 Hanbit Apartment, Eoeun-dong, Yuseong-ku, Daejeon 305-755 (KR). **YOON, Kyung Koo** [KR/KR]; 126-903 Hanbit Apartment, Eoeun-dong, Yuseong-ku, Daejeon 305-755 (KR). **LIM, Hyung Sup** [KR/KR]; 218-401 Hanyang Apartment, Sunbu-dong 1086, Ansan 425-140, Kyungki-do (KR).

(74) Agents: **BAEK, Duk Yeul** et al.; 18th Floor, Marine Center Main Building, 118 Namdaemun-ro 2-ka, Chung-gu, Seoul 100-770 (KR).

(81) Designated States (national): CN, JP, US.

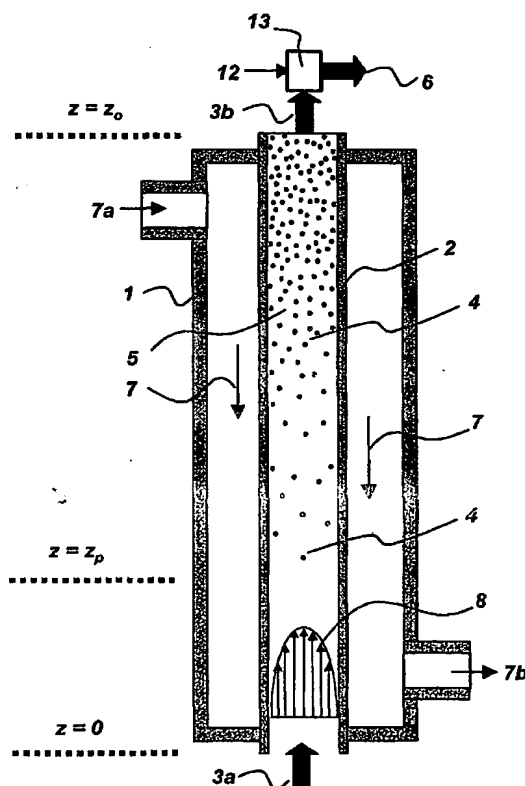
(84) Designated States (regional): European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD FOR CONTINUOUS PREPARATION OF NANOMETER-SIZED HYDROUS ZIRCONIA SOL



(57) Abstract: The present invention relates to a method a method for continuous preparation of a well dispersed spherical hydrous zirconia particles with an average diameter ( $d_p$ ) of 1~1,000 nm in the form of sol solution, which method comprises continuously supplying the aqueous solution of a zirconium salt at a concentration of 0.001~0.5 mole/l to a reactor consisting of one or more than two reaction tubes at a temperature of less than 25°C, heating the said aqueous solution in the reactor(s) in a continuous flow state up to the boiling point, and then discharging the said solution through the outlet of the said reactor(s). Contrary to the method employing a conventional batch-type reactor or semi-continuous stirred-type reactor, the method for continuous preparation of a hydrous zirconia sol according to the present invention can allow various operational parameters to be controlled in a certain range and thus contributes to remarkably improve the quality of a hydrous zirconia sol to be prepared or of the zirconia powder obtainable as a final product.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2003/002619

**A. CLASSIFICATION OF SUBJECT MATTER****IPC7 C01G 25/00, C01G 25/02**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC7 C01G, C04B, B01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and applications for inventions since 1975

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 03-205317 A (Tosoh Corp.) 6 September 1991 see the whole document	1, 2, 6
A	US 5,004,711 A (Harshaw/Filtrol Partnership) 2 April 1991 see the whole document	1, 5, 6, 9
A	JP 04-187520 A (Tosoh Corp.) 6 July 1992 see the whole document	1, 11
A	US 4,784,794 A (Nissan Chemical Industries, Ltd.) 15 November 1988 see the whole document	1

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

18 MARCH 2004 (18.03.2004)

Date of mailing of the international search report

19 MARCH 2004 (19.03.2004)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office  
920 Dunsan-dong, Seo-gu, Daejeon 302-701,  
Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE, SI GEUN

Telephone No. 82-42-481-8151



**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

PCT/KR2003/002619

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 03-205317 A	06.09.1991	None	
US 5,004,711 A	02.04.1991	None	
JP 04-187520 A	06.07.1992	None	
US 4,784,794 A	15.11.1988	JP 62162626 A2	18.07.1987
		CN 87100809 A	28.10.1987
		AU 6756587 A1	16.07.1987
		EP 229657 A1	22.07.1987
		EP 229657 B1	08.05.1991
		CN 1013433 B	07.08.1991
		AU 596390 B2	03.05.1990
		DE 3769803 C0	13.06.1991
		KR 9301258 B1	22.01.1993
		JP 7029771 B4	05.04.1995